Questions and Answers
Final Listing of Rusty Patched Bumble Bee as Endangered

1. What action is the U.S. Fish and Wildlife Service taking?
The U.S. Fish and Wildlife Service is protecting the rusty patched bumble bee (*Bombus affinis*) as an endangered species under the Endangered Species Act (ESA).

To list the rusty patched bumble bee as endangered, we first published a proposed rule in the *Federal Register* on Sept. 22, 2016, and opened a 60-day public comment period. We then gathered and analyzed comments and new information received during that comment period. Based on that analysis, we determined that the rusty patched bumble bee is in danger of extinction, which is the definition of an endangered species. We published a final rule in the *Federal Register* on January 11, 2017, that adds the rusty patched bumble bee to the list of endangered species. The final rule has an effective date of February 10, 2017.

2. Is this the first bee listed – weren't seven bees listed previously?
In September 2016, the Service listed 7 species of yellow-faced bees as endangered. These were the first bees in the United States listed under the ESA. However, they are only found in Hawaii and they are not bumble bees. The rusty patched bumble bee is the first bee listed in the Continental United States (all states outside of Hawaii) and it is the first bumble bee listed.

3. What is the rusty patched bumble bee and where is it found?
The rusty patched bumble bee is one of 47* bumble bee species found in North America. Before the mid- to late-1990s, it was considered abundant across a broad geographic range that included the District of Columbia and the following 28 states and two Canadian provinces: Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Ontario, Pennsylvania, Quebec, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, and Wisconsin. Since 2000, this bumble bee has been reported in only a few places in 13 states and one province: Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Minnesota, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, Wisconsin – and Ontario, Canada.

The rusty patched bumble bee is a colonial insect with an annual cycle that starts in early spring when solitary queens become active after winter dormancy. These solitary queens begin new colonies by producing female workers that collect pollen and nectar throughout the summer as the queen continues laying eggs. The annual cycle ends with the production of males and new queens in late summer and early fall. The males mate with the new queens and then die, while the new queens go into diapause (a form of hibernation) over winter. The old queen and workers also die and the cycle begins again in early spring when solitary new queens emerge from winter diapause.

Survival of a colony requires a continuous supply of flowering plants from early spring through fall, undisturbed nest sites near those flowering plants, and overwintering sites for the next year's queens. Healthy populations of the rusty patched bumble bee may include tens to hundreds of colonies. The health of bumble bee populations depends on the quantity and quality of available nectar and pollen and the proximity of flowering plants to nest sites.

The rusty patched bumble bee has been observed and collected in a variety of habitats that include prairies, woodlands, marshes, agricultural landscapes and residential parks and gardens.

** A bumble bee collected in Alaska during a 2012 survey was formally identified as a new species in a technical journal article published in October 2016. http://www.tandfonline.com/doi/abs/10.1080/00222933.2016.1214294?journalCode=tnah20&*

4. Why is the Service listing the rusty patched bumble bee as endangered?
Historically, the rusty patched bumble bee was abundant and widespread across the eastern United States and Canada. Since the late 1990s, rusty patched bumble bee abundance, measured in numbers of populations, has declined by about 87 percent. The decline may actually be higher because many of the populations that we considered current for our assessment have not been reconfirmed since the early 2000s and may no longer persist.

As numbers within a population decline, the bumble bee's reproductive strategy makes it particularly vulnerable to the effects of small population size. As population numbers decrease, there is an increased chance of related individuals mating, which results in an increase in the proportion of the population made up of sterile males. In this way, successful reproduction is further reduced and an extinction spiral occurs as proportionally fewer and fewer females and fertile males are produced.

Along with the loss of populations, the geographic distribution markedly decreased in the last 20 years. Before the 1990s, the rusty patched bumble bee was broadly distributed across the eastern U.S., upper Midwest, and southern Quebec and Ontario, across 394 counties in 28 states, the District of Columbia, and two provinces. The bee's current distribution is only 13 percent of its historical extent. Since 2000, researchers have found the rusty patched bumble bee in only 55 counties in 13 states and 1 province.

5. What is causing the loss of rusty patched bumble bees?
The rusty patched bumble bee declined rapidly during a time when bumble bee monitoring was largely limited to a few researchers. No one was aware of the rapid decline until it was well underway. There were no long-term studies specifically designed to document that the decline was occurring or to document why it was occurring. After the fact, researchers are trying to piece together the most likely causes and to set up studies to help verify their hypotheses. Experts have identified multiple threats that have likely contributed to the rusty patched bumble bee's dramatic decline. Those threats include disease, pesticides, the effects of climate change, habitat loss and the effects of small population dynamics. It appears that no one single factor is likely responsible, but these threats working together have likely caused the decline.

Disease
The precipitous decline of several wild bumble bee species (including the rusty patched) since the mid-1990s occurred at the same time that commercially-bred western bumble bees (*B. occidentalis*) experienced severe declines. The collapse in commercially-bred bumble bees was attributed to the parasitic fungus called *Nosema bombi*. Some researchers attributed the declines in wild bumble bees to the spread or "spillover" of the fungus from the commercial colonies to the wild populations. However, spillover does not completely explain the patterns of losses observed in wild bees like the rusty patched. Chronic spillover of disease-causing organisms (*i.e.*, bacteria, fungi or viruses) from commercial bumble bees as a main cause of wild bumble bee declines is still being debated among scientists.

Pesticides
Pesticides are widely used in agricultural, urban and even natural areas, which exposes native bumble bees and other pollinators to multiple insecticides, fungicides, and herbicides. Insecticides and herbicides have the most potential to harm bumble bees: insecticides because they are specifically designed to kill insects and herbicides because their use can reduce or eliminate available flowers that bumble bees need for pollen and nectar.

Certain pesticides have been documented to both harm and kill bumble bees. For example, neonicotinoids are a class of insecticides used to target pests of agricultural crops, forests, turf, gardens and pets. Neonicotinoids have been strongly implicated as the cause of the decline of bees, in general, and for rusty patched bumble bees, specifically. The introduction of neonicotinoid use and the precipitous decline of this bumble bee occurred during the same time. Neonicotinoids are of particular concern because they are systemic chemicals, meaning that the plant takes up the chemical and incorporates it throughout, including in leaf tissue, nectar and pollen. The use of neonicotinoids rapidly increased when suppliers began selling pre-treated seeds. The chemical remains in pre-treated seeds and is taken up by the developing plants and becomes present throughout the plant. Pollinators foraging on treated plants are exposed to the chemicals directly. This type of insecticide use marked a shift to using systemic insecticides for large-scale, preemptive treatment.

Most studies examining the effect of pesticides on bees have been conducted using the European honey bee (*Apis mellifera*). Bumble bees, however, may be more vulnerable to pesticides than honey bees. For example, bumble bees are more susceptible to pesticides applied early in the year because, for one month, the entire bumble bee population depends on the success of the solitary queens that emerge from winter diapause. The loss of one queen means the loss of an entire colony. In contrast, honey bees have many workers supplying a single colony, even in early spring. In addition, best practices to spray pesticides and herbicides in the early morning or late in the day when honey bees are less active may inadvertently expose bumble bees because they are better adapted to foraging in cooler temperatures and lower light conditions.

Effects of Climate Change
Global climate change is one of the most significant risks to biodiversity worldwide. However, specific impacts of climate change on pollinators are not well understood. The changes in climate likely to have the greatest effects on bumble bees include: increased drought, increased flooding, increased storm events, early snow melt, late frost, and increased variability in

temperatures and precipitation. These changes may lead to decreased resource availability (due to mismatches in timing, such as lack of available flowers early in the flight period), decreased availability of nesting habitat (due to changes in rodent populations or increased flooding or storms), increased stress from overheating (due to higher temperatures), and increased pressures from pathogens and non-native plants and animals.

Habitat Loss and Degradation
Habitat loss is unlikely to have been a main driver of the recent (since the mid- to late 1990s), widespread North American bee declines. But, intensive farming has reduced and degraded habitat for the rusty patched bumble bee and is likely a factor working in concert with other threats to exacerbate declines. Large areas dominated by a single crop cover do not provide the diversity of flowering plants that bumble bees need from April through October. Traditionally, field borders and "weeds" growing within crop fields provided that diversity. But widespread use of herbicide-resistant genetically modified crops and resulting broad-spectrum herbicide application has almost eliminated weeds from crop fields and reduced flowering plants from field borders. At the same time, intensive farming practices have led to converting fencerows, field borders and roadsides to crops. The result is little habitat for bumble bees across most agricultural lands.

Small Population Dynamics
Various types of surveys were used to document rusty patched bumble bee populations. Most populations we consider current were documented by only a single or few individuals found during those surveys; only 1 population had more than 30 individuals observed in any given year. This indicates that most remaining populations exist at very low numbers. The bumble bee's reproductive strategy makes it particularly vulnerable to the effects of small population size. As population numbers decrease, there is an increased chance of related individuals mating, which results in an increase in the proportion of the population made up of sterile males. In this way, successful reproduction is further reduced and an extinction spiral occurs as proportionally fewer and fewer females and fertile males are produced.

6. We have heard a lot about the decline of honey bees, monarch butterflies and other pollinators. Are the reasons for honey bee and monarch declines the same for the rusty patched bumble bee?
There are a number of factors affecting all three of these insects; some affect all three, although they may affect each species differently.

According to the U.S. Department of Agriculture (www.ars.usda.gov/News/docs.htm?docid=15572): "Major factors threatening honey bee health can be divided into four general areas: parasites and pests, pathogens, poor nutrition, and sublethal exposure to pesticides. In reality though, these factors tend to overlap and interact with one another, which complicates issues. In addition, there are other issues that have impacts on honey bee health, such as the narrow genetic base of honey bees in the United States."

The Monarch Joint Venture website has the following statement . . . "Monarchs face many risks that are resulting in declining populations in both the eastern and western parts of their North American range. The largest impacts come from the loss of habitat for breeding,

migrating, and overwintering. In addition, pesticides that are used to control insects and weeds have harmful unintended consequences for monarchs, a changing climate may be making some habitat less suitable and forcing changes in migratory patterns, and monarchs face many risks from natural enemies, such as predators, parasitoids, and diseases."

It is clear that there is overlap in the factors causing declines of honey bees, monarchs and rusty patched bumble bees. Primary threats affecting both honey bees and rusty patched bumble bees are pathogens and pesticides. Threats affecting monarchs and rusty patched bumble bees are pesticides, habitat loss and climate change. While the impacts to each are different, the primary threats are very similar.

7. Will actions taken to help honey bees and monarch butterflies also help rusty patched bumble bees?

In general, actions to protect and conserve pollinators are actions most likely to benefit the rusty patched bumble bee and other bumble bees.

Some of the research examining causes of honey bee declines also help explain impacts to rusty patched bumble bees, particularly the research on the effects of pesticides. However, honey bees are not native bees and much of the research is targeted at ensuring their continued survival for commercial purposes. Therefore, not all of this research is applicable to or beneficial for native bees. Additional research is needed to examine the effects of stressors on bumble bees. Additionally, loss of native habitats and climate change are not factors causing honey bee declines.

Habitat restoration and conservation for monarchs in the U.S. and Canada also provide habitat for bumble bees, including the rusty patched. However, the life history, biological and ecological needs of both species are quite different. Habitat maintained specifically for monarchs could fall short of providing for the needs of bumble bees. For example, rusty patched bumble bees need flowers as food resources consistently from April through October, whereas the monarch is migratory and needs flowering plants during only a portion of the growing season. But, with a few adjustments, good monarch habitat can provide habitat needs for the rusty patched bumble bee and many other pollinators. Many guides for pollinator gardens are available online; check out the Xerces Society "Pollinator-Friendly Plant Lists" at www.xerces.org/pollinator-conservation/plant-lists/.

8. How does listing as endangered under the Endangered Species Act help conserve the rusty patched bumble bee?

Listing under the Endangered Species Act helps conserve species in several ways. Listing focuses conservation planning and funding, raises awareness that can lead to additional conservation opportunities and partners, and by regulation protects listed species from intentional and unintentional harm.

The Endangered Species Act requires the Service to prepare a recovery plan for each listed species. A recovery plan identifies and prioritizes actions needed to conserve and recover a species. Non-governmental agencies, universities, tribes and other federal and state agencies often carry out conservation actions identified in recovery plans.

Federally listed threatened and endangered species are usually considered as priorities during land-use planning.

Listing protects species by prohibiting "take" under section 9, unless otherwise permitted. The take prohibition includes significant habitat modification or degradation that results in the direct killing or injury to listed animal species. States may also have their own laws restricting activity that affects federally listed species.

In addition, section 7 of the Endangered Species Act protects listed species by requiring that other federal agencies consult with the Service to ensure that their actions are not likely to jeopardize the continued existence of a listed species. Through this consultation, the Service works with the federal agency and advises on whether the actions would affect the species or critical habitat as well as ways to avoid those impacts. Listed species often become priorities for grants and other funding because of the section 7(a)(1) requirement that all federal agencies use their authorities to carry out programs for the conservation of threatened and endangered species.

9. Why is it important to conserve the rusty patched bumble bee?

The decline of the rusty patched bumble bee happened relatively recently and very dramatically. The causes of that decline are continuing to act across a broad geographic area, impacting other native pollinators. Preventing extinction of this bumble bee will help address the factors causing the decline and identify how those factors work together to harm native bee and other pollinator populations.

In the United States and globally, native bees are responsible for most pollination of plants that require insect pollination to produce fruits, seeds, and nuts. Native bees not only pollinate economically important crops, but provide the foundation of functioning ecosystems; pollination is required for plant reproduction and plants are the base of the food chain. The plight of the rusty patched bumble bee is not an isolated occurrence, but a symptom of widespread decline of other bumble bees and many other insect pollinators.

Bumble bees, as a group, are some of the most significant pollinators. The reasons that bumble bees are so important for pollination including the following attributes. Although bumble bees show a preference for certain native flowers, they are generally not picky about where they get their nectar and pollen - almost any source of flower will do. Bumble bees can fly in cooler temperatures and lower light levels than many other bees, which makes them excellent crop pollinators. They also perform a behavior called "buzz pollination," in which the bee grabs the pollen-producing structure of the flower in her jaws and vibrates her wing muscles - dislodging pollen from the flower. Some plants, including tomatoes, peppers, and cranberries, benefit from buzz pollination. Even for crops that can be self-pollinated (for example, some tomatoes), the plant produces more and bigger fruits with bumble bee-aided pollination.

Measures to identify and address threats and prevent the extinction of the rusty patched bumble bee will help conserve other native pollinators, including other bumble bee species.

10. What can I do to help the rusty patched bumble bee?
Garden: Grow a garden or add a flowering tree or shrub to your yard. Even small areas or containers on patios can provide nectar and pollen for native bees. Plant a variety of flowers that bloom throughout the growing season from April through October. Fruit trees typically bloom early in the spring, which is a critical time for foraging bumble bee queens. Try to ensure that your new plants have not been treated with neonicotinoids or other systemic pesticides.

Plant natives: Use native plants in your yard such as lupines, asters, bee balm, native prairie plants and spring ephemerals. Don't forget spring blooming shrubs like ninebark and pussy willow! Avoid invasive non-native plants and remove them if they invade your yard. For more information on attracting native pollinators, visit www.fws.gov/pollinators/pdfs/PollinatorBookletFinalrevWeb.pdf.

Foster native landscapes. Many native bumble bees build their nests in undisturbed soil, abandoned rodent burrows or clumps of grass. Preserve unmown, brushy areas and tolerate bumble bee nests when you find them. Reduce soil tillage, raking and mowing where bumble bees might nest. Support natural areas in your community, county and state.

Do not use pesticides. The intent of applying an insecticide is to kill insects, which can also kill non-target insects. It can be difficult to keep insecticides in the specific area applied because it may be carried by wind or water to non-target areas. Additionally, widespread application of insecticides for preventative purposes, such as planting neonicotinoid-treated seeds or bedding plants, results in repeated applications of insecticides broadly across the landscape. Not only are insects that use treated fields affected, but research has shown insecticides can be carried offsite in the dust of seeds during planting, by rain water, and by uptake of plants along field edges. Many plants sold at nurseries are treated with systemic pesticides, so the pollen and nectar from those plants may kill or harm pollinators and other insects. Check with your garden supplier to ensure that plants have not been treated with neonicotinoids or other systemic pesticides.

Herbicides kill plants so the result of herbicide use is to reduce the numbers of flowers available for bumble bees to feed. Some herbicides have insecticidal properties, or are mixed with insecticides, and can be carried offsite by wind and rain.

Minimize your use of pesticides. If you feel you cannot avoid all pesticide use, apply pesticides only where and when needed. Apply only at the labeled rate and carefully follow label directions to avoid drift into non-target areas.

11. What does this listing mean for private landowners?
An activity that harms or destroys (i.e. “takes”) an endangered species is prohibited under the ESA. We recognize, however, that the rusty patched bumble bee only remains on lands where management or land use has allowed them to survive while the bee has died off elsewhere. Landowners deserve credit for their stewardship and we want to encourage their management or land use practices that support the bumble bees and other insect pollinators. Permits can be obtained to take listed species, if the action is an otherwise legal activity. We will

work with landowners and organizations in areas near current occurrences of the rusty patched bumble bee to determine if a permit should be requested for ongoing or proposed activities.

The Service strives to find ways to work with people while protecting imperiled species and is committed to working with private landowners, public land managers, conservation agencies, nongovernmental organizations, and the scientific community to prevent the extinction of the rusty patched bumble bee.

We expect to work cooperatively with landowners and local organizations to encourage and promote bee-friendly practices on lands near current occurrences of the rusty patched bumble bee. Some of these practices include using native flowering plants in landscaping, providing plants that bloom from spring through fall and avoiding use of pesticides, especially systemic insecticides. These practices benefit all pollinators which, in turn, likely improves the flowering success in gardens and crop production.

12. Will the Service be contacting landowners whose property supports rusty patched bumble bees?

Conserving remaining populations of the rusty patched bumble bee is key to preventing its extinction. We will contact federal, state and local agencies that own lands with recent records of rusty patched bumble bees so that we can work with them to stop the extinction of this bumble bee. At this time, we do not have plans to contact individual private landowners. Although we have not developed a strategy yet, we will likely seek out landowner help in preventing further declines. To the best of our knowledge, the rusty patched is no longer present in large-scale agricultural areas. The private lands where it is found are mostly yards and gardens. The most effective way to work with private landowners may be to work with existing groups (municipal or environmental) to reach out to landowners in areas with recent records.

13. Where can I learn more about the rusty patched bumble bee and the final rule to list it as endangered?

Information is online at www.fws.gov/midwest/endangered or you may contact the U.S. Fish and Wildlife Service's Twin Cities Field Office at:

Peter Fasbender, Field Supervisor
U.S. Fish and Wildlife Service
Twin Cities Ecological Services Field Office
4101 American Blvd. E., Bloomington, MN 55425

Telephone 952-252-0092, extension 210.

If you use a telecommunications device for the deaf (TDD), call the Federal Information Relay Service (FIRS) at 800-877-8339.

The Xerces Society also has information about the rusty patched bumble bee and other imperiled insects at http://www.xerces.org/. Bumble Bee Watch is a citizen science website that is helping to track occurrences of our bumble bees. You can help by submitting your photos at https://www.bumblebeewatch.org/.

14. I am interested in helping prevent the extinction of the rusty patched bumble bee. What can I do?

If you have a suburban yard, an urban lot, a patio or an apartment balcony, you can provide habitat for rusty patched bumble bees, other bumble bees and other bees and butterflies. All of these insects need:

1. Flowers in bloom from early spring through fall. Include native milkweeds for monarch butterflies.

2. A safe place to build their nests and overwinter. Leave some areas of your yard or patio containers untilled in summer – and leave some areas unraked with standing plant stems in winter.

3. A pesticide and disease free environment.

If you want more detailed information or you own or manage larger properties, here are some resources:

Conserving Bumble Bees: *Guidelines for Creating and Managing Habitat for America's Declining Pollinators at www.xerces.org/bumblebeeguidelines*

Pollinator Conservation Resource Center: regional information about plant lists, habitat conservation guides and more.
http://www.xerces.org/pollinator-resource-center/

Plant Lists by Region
http://www.xerces.org/providing-wildflowers-for-pollinators/

Helping with citizen science projects can be fun and rewarding; if you are interested, check out these opportunities:

- Bumble Bee Watch – www.bumblebeewatch.org
- Million Pollinator Garden Challenge – www.millionpollinatorgardens.org
- Journey North (Monarch Butterflies) - www.learner.org/jnorth/monarch